

Appendix A - Example of Prepublished Content Product Entity Structure Part

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 ! Contrib_Affiliation:University of Alberta
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!Authored_Abstract:In the sections that follow, we discuss each of the preceding characteristics and how they will guide you to success as an engineering student.

A-3

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!Authored_Abstract:“How much do you know about engineering? Why did you choose to study engineering?What reasons lead you to believe that you are ready and equipped to study engineering?What are the main differences between studying at a university and studying in high school?What new success skills do you need to succeed in engineering study?Can you write down 10 answers to each question I have asked you? Go ahead and try.”

!Authored_Abstract:This is often how I begin my lecture to freshman engineering students enrolled in an introductory engineering class. After a little thought, most of them realize just how little they know about this subject called engineering and (often despite excellent high school averages) how ill equipped they are to study engineering.

!Authored_Abstract:In this chapter, we address both issues. First, we ask the following questions:What is engineering?What do engineers do?Why choose to study engineering?

!Authored_Abstract:The answers to these questions are not only interesting and informative, but will help keep you motivated along the long, hard road to an engineering degree. Ability and hard work might get you through the initial stages, but after that, you must have a driving force, something that will sustain you through the hard times. You must develop a powerful motivation. The best way to do this is to learn as much as possible about the rewards of an engineering degree. Perhaps write them out and pin them on your wall or paste them inside your calculus book. Keep them close at hand. They will keep you determined and strong. This is exactly what the most successful engineering students do; they remain focused by keeping in mind the reasons they chose engineering and the rewards associated with entering the engineering profession. Make it a priority to keep learning about engineering, so that you will become aware of all the opportunities and rewards as they arise throughout your course of study. This will fuel your motivation and your desire to succeed. The more important it becomes for you to graduate, the more likely you are to do so.

!Authored_Abstract:In , we address the question, “Are you prepared and equipped for engineering study?” In doing so, we examine the study skills required to succeed in the university environment. For many students, the university is the next logical step after high school, the next academic challenge. Consequently, they expect their freshman year in engineering to be much like another year of high school-which, of course, it isn’t. In engineering, such an exception often manifests itself in unacceptably high first-year attrition rates. We address this issue by focusing on what you need to do to ensure the best possible start to earning your engineering degree. Essentially, you must develop the necessary:Work strategiesStudy strategiesAttitudesCommunication skillsAbility to work as part of a teamTime management skills

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!Authored_Abstract:Universities and colleges have always played a pivotal role in training engineers. In addition to providing the environments and opportunities necessary for learning, they continually collaborate with professional engineering organizations and engineering accreditation boards to develop engineering programs that are up to date and compatible with the ever-changing needs of modern society.

!Authored_Abstract:Your decision to pursue an engineering education has committed you to spending the next four or five years learning (or training) in a university environment. Consequently, you must learn how to be most effective as an engineering student. The first step in doing so is to understand as much as possible about your learning environment, namely, its basic structure and how it works. This will ensure that you derive maximum benefit from each of the resources and facilities available as part of your engineering program.

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CHAPTER.C:0130808598.06.00.00

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!Title:Key Strategies for Maximizing Performance in Engineering Courses

!Authored_Abstract:Over the last 10 years, I have taught many different engineering courses at various levels, from an introductory level to a more advanced graduate level. At the end of each course, I approach the most successful students and ask them to describe their study or work habits and any special techniques they may have used to achieve that particular level of success. Year after year, the same answers keep coming back. These answers indicate clearly that the most successful engineering students practice, in common, a set of key study strategies specific to engineering courses. Perhaps even more significant is the fact that almost every one of these strategies is absent from the study habits of the less successful students. This is no surprise: These same skills used to be taught as part of any basic high school curriculum. Recently, however, weaknesses in the secondary education system have meant that most freshman engineering students arrive without these skills, and very few of them take the time to acquire them for themselves. As a result, many new engineering students find it difficult to make the transition between high school and college. This almost always leads to poor performance in the first year.

!Authored_Abstract:In this chapter, we address the issue of performance and present that very collection of study strategies used by the most successful engineering students. The strategies themselves are sufficiently general to be applicable to all engineering courses at any level. In particular, we discuss:Time management strategies.Preparing for an engineering course and making sure that your

prerequisite works.Effective note taking.Making effective use of the course textbook.How to be effective on assignments.Using posted solutions to assignments.Using tutors and study guides.

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!SKU:0000000014656

!Title:How to Be Successful on Examinations

!Authored_Abstract:Examinations invariably make up the single largest contribution to your final grade in any engineering course.

!Authored_Abstract:This simple fact explains why many engineering students are focused on examinations (quizzes, midterms, and finals), rather than on an appreciation of the course material. Like it or not, your performance on examinations will more or less determine how well you do in your engineering courses. For this reason, it is essential to understand why the very best engineering students are so successful in examinations and to learn how to use this information to your advantage.

!Authored_Abstract:So why do certain students perform so much better than others on examinations? Some students put it down to a simple matter of intelligence: "Oh, that girl is really smart. Her father is a physics teacher and her mother has a Ph.D. No wonder she scores over 90 percent on all her tests." Others put it down to the lack of a social life: "That guy never goes out. He

does nothing but study. No wonder he performs so well on tests!” I suggest that neither is entirely correct and that the truth lies somewhere in between. At senior high school and junior college levels, intelligence alone is no longer sufficient to place someone in the top 5 of the class. There is far too much material to absorb and not enough time in which to absorb it-even if you devote all your time to studying. In fact, it has been my experience that the very best students have an extremely active social life. Indeed their level of success often increases with their level of activity. Achieving success has more to do with how you prepare for an examination and what you do to prepare.

!Authored_Abstract:I learned early on in my academic career that

!Authored_Abstract:knowing the course material ≠ success in course examinations.

!Authored_Abstract:I recall my midterm examination from my first engineering mechanics course. I had worked consistently throughout the year, understanding the course material, doing every assignment, and working through extra practice problems (in much the same way as I did when I was in high school). I understood the main ideas and concepts, and I was able to apply them in different situations. So I was quite confident that I would do well on the examination. Imagine my surprise when I discovered that I had scored only 58 percent! Worse than that, many of those students scoring above me had performed poorly throughout the course having missed assignments and often asking me for help. I couldn’t understand why this happened. I had worked hard and I knew the material, so why wasn’t I performing to the best of my ability? I began to discover the answer to my question when I asked one of my classmates (who had the highest score on the test) how she had prepared for the examination. It became clear to me that there were some missing ingredients in my test preparation routine. Basically, it came down to two things:

!Authored_Abstract:Smart practiceExamination technique

!Authored_Abstract:My friend and I had both prepared well during the course. What made the difference in our midterm scores was what we did in preparing for the test itself. She had obviously regarded the test as a separate entity, targeting and tailoring all her efforts not solely toward reviewing the course material (as I did), but toward doing well on the test itself (smart practice). She had obtained many former and practice midterm examinations and rehearsed her performance, so that she had a much better idea of what was expected and how to demonstrate the required knowledge under a time constraint (examination technique). She was entirely focused on doing well on the examination. I, on the other hand, was focused on the course material, believing that to be sufficient to perform to the best of my ability on the midterm.

!Authored_Abstract:To understand why my friend’s strategy was so much more effective than mine, let’s return to the car-driving analogy. None of us believe that we can pass a standard driving test simply by driving the way we do in everyday life. We recognize that a driving test requires us to demonstrate a distinct collection of maneuvers and exercises, based on basic driving skills, under examination conditions. Conversely, no one continues to drive the way they did during their driving test. The latter is a rehearsed performance, requiring specific targeted practice based on a knowledge of exact requirements (smart practice) and a focused effort to perform well under specific test conditions (examination technique). Consequently, in preparing for a driving test, we find out as much as we can about what is required and target our preparation (as effectively as possible) toward those particular goals. Exactly the same principles apply to preparing for any test, academic or otherwise.

!Authored_Abstract:In fact, since that first mechanics midterm, an acknowledgment of these basic principles has allowed me to perform to the best of my abilities on all subsequent examinations, such as academic examinations (in many different disciplines), driving tests, athletics competitions, or whatever requires me to demonstrate performance under a given set of constraints.

!Authored_Abstract:In this chapter, we discuss, in detail, the many different aspects of maximizing performance on examinations, including, in particular, the two main ingredients: smart practice and examination technique.

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!SKU:0000000014663

!Title:Procedures for Effective Problem Solving

!Authored_Abstract:We have already noted that examples and practice problems are essential components of maximizing one's performance in any engineering course. Consequently, a significant amount of course time (lectures, tutorials, labs, and assignments) is devoted to worked-out examples and relevant practice problems.5 and , we emphasized the importance of presentation in developing effective problem-solving techniques-in other words, how an effective solution requires that you demonstrate a clear, logical, and organized procedure.--> In this chapter, we examine actual problem-solving strategies. We illustrate our ideas with worked-out examples from different engineering courses.

!Authored_Abstract:Basically, two types of problems are encountered in engineering courses:

!Authored_Abstract:Type AThose that require mainly the application of known techniques and minimal thinking. In other words, these problems require you to repeat from memory, know the meanings of certain key concepts, and apply established course material to new situations. Such problems are also known as plug-and-chug problems, solved by applying a formula or set procedure. This type of problem is

common in introductory mathematics courses, such as beginning calculus, where you are often asked to use set procedures to, for example, differentiate . . . , integrate . . . , solve . . . , and so on.

!Authored_Abstract:Type B Those that require mainly thinking and minimal application of established techniques. These problems exercise the higher level thinking skills and, as such, are often more difficult than Type A problems. They usually involve some mathematical modeling, followed by the evaluation and application of selected mathematical techniques (usually from the course material) and, finally, the interpretation of results in the context of the physical problem. Type B problems include those commonly referred to as word problems and are usually found in courses such as engineering mechanics and physics, where real physical situations must first be translated into mathematical language before known procedures can be applied.

!Authored_Abstract:In the sections that follow, we examine procedures used to solve each type of problem.

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!SKU:0000000014670

!Title:Mathematics

!Authored_Abstract:Mathematics is the language of engineering. It is the vehicle by which ideas are analyzed, developed, and communicated in engineering. We have already seen this in , where we used mathematical modeling to solve word problems. It is no accident, therefore, that the undergraduate engineering curriculum includes several mathematics courses, each one designed to give you adequate skill and knowledge to deal with engineering problems of increasing complexity. (See .)

!Authored_Abstract:Besides furnishing you with the tools of the profession, engineering mathematics courses are intended to develop the logical, rational, problem-solving skills that are so crucial to good engineering practice. Some of the best mathematicians I know are engineers. For

example, my colleague David Steigmann is a professor of mechanical engineering at the University of California at Berkeley. As a research engineer, David is interested in mathematics primarily as a means to an end; his main interests lie in solving problems related to continuum mechanics, shell theory, elasticity, the stability of mechanical structures, surface stress in solids, capillary phenomena, and the mechanics of thin films. Yet, in analyzing these problems, he has developed significant mathematical expertise, which puts him among the best in the world!

!Authored_Abstract:You should regard your mathematics courses in the same way-as a means to an end-courses designed to equip you with the necessary skills to succeed in engineering. You don't have to love mathematics or even appreciate its beauty. Just learn how to use it effectively to solve engineering problems-that's the key.

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A-51

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CHAPTER.C:0130808598.10.00.00

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!Title:Developing Engineering Skills

!Authored_Abstract:Excellent technical engineering skills are, in themselves, not sufficient to guarantee a successful career in engineering. The following is a list of skills that employers are constantly demanding. The ability to communicate effectively, including The ability to write clear, coherent technical documents. The ability to present well-researched, well-organized seminars confidently and competently. The ability to work effectively in teams with people from different backgrounds. The ability to demonstrate creativity in all aspects of the profession. The ability to manage personnel and resources in engineering projects. The ability to keep up to date with developments during one's years as a professional engineer.

!Authored_Abstract:These skills are highly prized by employers. Acquiring such skills will not only give you the edge in employability, but also allow you to go well beyond your training as an engineer towards an ever-expanding number of exciting and challenging opportunities.

!Authored_Abstract:What can you do to give yourself a head start and acquire the foregoing skills before you graduate? We have already discussed how teamwork and independent learning skills Chapter 4) --> can contribute to success in engineering study. Practicing these skills as an undergraduate engineering student is an excellent way to equip yourself beforehand with at least three of them: The ability to work effectively in teams with people from different backgrounds. Your experience with teamwork as an undergraduate engineering student will make this skill second nature to you by the time you graduate. Not only will you know how to work as part of a team, but you will have the ability to organize and manage teams. The ability to keep up to date with developments in engineering. As an engineering student, you become well accustomed to learning and thinking independently. The ability to keep up to date with developments in engineering requires that you find and assimilate information independently, as required. This is exactly what you do as a resourceful, committed undergraduate engineering student. The ability to manage personnel and resources in engineering projects. Practicing teamwork and independent learning together means that you learn to manage not only your own resources (time, energy, money, etc.), but also the resources of those around you. You learn how to find information effectively, how to use that information to attain a defined goal, and how to communicate the information to other group members.

!Authored_Abstract:In this chapter, we concern ourselves with the remaining two engineering skills: The ability to communicate effectively, including The ability to write clear, coherent technical documents. The ability to present well-researched, well-organized seminars confidently and competently. The ability to demonstrate creativity in all aspects of the profession.

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CHAPTER.C:0130808598.11.00.00

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!Title:Looking to the Future: What's after Graduation?

!Authored_Abstract:Our discussion so far has been concerned with maximizing performance in engineering study. The ultimate goal has been the successful completion of your undergraduate degree in engineering, the foundation of your engineering education. Upon completing your degree, you will have a variety of options for what to do next. Basically, the choice comes down to one of the following two possibilities:

!Authored_Abstract:Go to work as a practicing engineer. Continue your study towards a graduate degree.

!Authored_Abstract:In this chapter, we will take a brief look at both options.

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 ! Contrib_Last_Name:Schiavone
 ! Contrib_Affiliation:University of Alberta
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